THE SMALL COMPUTER VS. THE TIME-SHARING SYSTEM

By

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When I first encountered EduSystem 10, a stand alone PDP-8/L computer with 4,096 word memory, it seemed to me that such a small computer would surely not be able to provide me with the service I was receiving from a commerical time-sharing service. Still, being a fair-minded individual, I thought I'd give the "little feller" a chance. What follows is an evaluation of my experiences in using this tiny competitor of the larger systems.

Initially, I found that I had been correct in many respects. You do lose certain advantages of the large time-sharing system. In particular, the following "flaws" were found:

1. The ability to store programs on a disc was lost to me.
2. The ability to handle large amounts of data was curtailed.
3. The ability to use long programs was lost to a great degree.
4. The ability to use FORTRAN IV was completely lost.
5. The length of BASIC programs is required to be rather short.

Before considering the advantages accruing from the use of the PDP-8/L, I would like to consider each of its "flaws" individually.

First, the ability to store programs on a disc is lost only to those selecting a minimal configuration - that's me, the small user. It is always possible to extend the system to include this facility whenever the user can muster the funds (and these amount to little more than the cost of two years use of time-sharing, even for the small user). However, for my purposes, such a loss was certainly not critical. In a small school such as ours, each student who wishes to save a program merely has a paper tape of the final program punched out on the tape punch. This tape he can keep off-line. Naturally, this requires more time but administrators are frequently more generous with time than money.

Second, the ability of handling large amounts of data is clearly lost. Nevertheless, after careful consideration, I found this to be not serious. If the computer is a tool of the Mathematics Department, there seems to be no real need for such abilities. My students have found the capacity of the PDP-8/L very sufficient for their needs. There are very few problems in the high school experience that require such a capacity. The statistics course has made the greatest demands and these have been satisfied. We have done correlation studies involving any number of scores, made frequency distributions, and at present are working on multiple correlations. I seriously doubt if there will be any problems in this area.

Third, there can be no doubt that the smaller core area curtails the length of possible programs. However, as yet I have not found a problem in the high school range that I could not solve on the PDP-8/L. At times a little ingenuity is needed, but this may be turned to a positive point when teaching optimization of programs. In the time-sharing mode, I found my students frequently wrote sloppy programs and defended themselves with "but it runs". This is much harder with limited core.

Fourth, the loss of FORTRAN IV is real and I greatly regret this. There is a two-pass FORTRAN compiler for those desiring to write FORTRAN programs, but this is not likely to be found convenient to the time-sharer used to FORTRAN. From my own point of view, programming and problem analysis are independent of the language used; therefore, I cannot say that I found this to be an unsurmountable obstacle. As a matter of fact, students can be made far more aware of the meaning of compilation.

Lastly, the length of BASIC programs was curtailed. Nevertheless, all BASIC commands are available and by carefully placing several commands to a line this can be minimized. Areas by the Monte Carlo method and Trapezoid method, Irrational Roots by the Newton-Raphson method, Approximation of definite integrals, and numerous other problems are all easily handled. It seems clear that for teaching purposes program length is sufficient.

Now that I have exposed the failings of my little giant, I can sing its praises. I have been greatly impressed by the potential of the PDP-8/L as a teaching instrument. Where there have been limitations, I have become convinced that with extra efforts I can overcome them. Simply, I am enthusiastic.

The BASIC compiler on the PDP-8/L is more than adequate. It has some features not included with commercial time-sharing. An "immediate mode" permits one to use the computer as a calculator. The LET command is not required, hence the transition from algebra is even easier. Multiple statements per line permit reasonable size programs to be written.

Going one step beyond BASIC, I think I should comment on the FOCAL "compiler" unique to the PDP-8/L. This is a compile-and-go compiler which utilizes single letter commands (longer forms are permitted) to conserve core. Having used BASIC for some time with my previous classes, I was really surprised to find how much control was being given to me with so few commands. Not only do most BASIC commands convert over into FOCAL, but the ability to format is convenient and simple (I really like this simplicity).

For those who are inclined to make errors, I don't think they will find a more convenient way to edit than the modify command of FOCAL. I make errors deliberately just to try it out.

If you are familiar with BASIC you will certainly find that within minutes you will be able to write FOCAL programs. The transfer will come naturally.

For a user with a limited budget the greatest advantage of purchasing a small computer is unlimited use of the terminal. With the exception of those schools that can provide the rather considerable amount of money required to provide unlimited time (the cost of which equals in one year 5/6 of the cost of purchase), this is a definite plus. As a user in a small private school, my budget in this area was limited, and I found myself limiting my students to four hours of use per course. On my current machine one student used thirteen hours during the Thanksgiving holiday - a rare opportunity for a rare student.

It is to those interested in teaching computer science rather than programming - or should I say in addition to programming that the unit should be most attractive. It would be necessary to outline a complete course to list all the possibilities, yet I would like to point out the most obvious points to consider.

Perhaps the most stimulating aspect of working with a small computer was being able to demonstrate to my students many aspects of the computer which previously were discussed in a vacuum. When loading the BASIC compiler, I was really surprised to find them asking so many questions. I realized quickly that they had not completely understood the concept of a compiler.

Again, when modifying the compiler by toggling in steps via the console, several of my students seemed frankly amazed that I was making use of the console lights. I began to realize that they must have use of the hardware if they are to become proficient in their knowledge.

I am still learning - and having fun - every day. I may find limits to the "little feller" someday, but one can always expand the system later.